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SIST EN ISO 178:2019

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Polimerni materiali - Določanje upogibnih lastnosti (ISO 178:2019)

Plastics - Determination of flexural properties (ISO 178:2019)

Kunststoffe - Bestimmung der Biegeeigenschaften (ISO 178:2019)

Plastiques - Détermination des propriétés en flexion (ISO 178:2019)

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Kunststoffe - Bestimmung der Biegeeigenschaften (ISO 178:2019)

This European Standard was approved by CEN on 23 March 2019.

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Page

European foreword **3**

European foreword

This document (EN ISO 178:2019) has been prepared by Technical Committee ISO/TC 61 "Plastics" in collaboration with Technical Committee CEN/TC 249 “Plastics” the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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The text of ISO 178:2019 has been approved by CEN as EN ISO 178:2019 without any modification.

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Contents

Page

Foreword ... **iv**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms, definitions and symbols ... **2**

4 Principle ... **5**

5 Test machine ... **5**
5.1 General ... 5
5.2 Test speed ... 6
5.3 Supports and loading edge ... 6
5.4 Force- and deflection-measuring systems ... 6
5.4.1 Introductory remarks ... 6
5.4.2 Definition of precision and accuracy requirements ... 6
5.4.3 Deflection measurement ... 8
5.5 Equipment for measuring the width and thickness of the test specimens ... 9

6 Test specimens ... **9**
6.1 Shape and dimensions ... 9
6.1.1 General ... 9
6.1.2 Preferred specimen type ... 9
6.1.3 Other test specimens ... 10
6.2 Anisotropic materials ... 10
6.3 Preparation of test specimens ... 11
6.3.1 From moulding, extrusion and casting compounds ... 11
6.3.2 From sheets ... 11
6.4 Specimen inspection ... 11
6.5 Number of test specimens ... 12

7 Atmosphere for conditioning and testing ... **12**

8 Procedure ... **12**

9 Calculation and expression of results ... **16**
9.1 Flexural stress ... 16
9.2 Flexural strain ... 16
9.3 Flexural modulus ... 16
9.4 Statistical parameters ... 17
9.5 Significant figures ... 17

10 Precision ... **17**

11 Test report ... **17**

Annex A (informative) **Precision statement** ... **19**

Annex B (informative) **Influence of changes in test speed on the measured values of flexural properties** ... **21**

Annex C (normative) **Compliance correction for Type III-tests** ... **22**

Annex D (informative) **Relation between tensile and flexural modulus: Theoretical expectations and experimental observations** ... **24**

Bibliography ... **25**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

This sixth edition cancels and replaces the fifth edition (ISO 178:2010), which has been technically revised. It also incorporates the Amendment ISO 178:2010/Amd.1:2013. The main changes compared to the previous edition are as follows:

— differentiating calibration requirements according to the type of test;

— the introduction of deflectometers;

— the reinstatement of procedures for compliance correction;

— the addition of a new Annex D showing the relation between tensile and flexural modulus.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics — Determination of flexural properties

1 Scope

This document specifies a method for determining the flexural properties of rigid and semi-rigid plastics under defined conditions. A preferred test specimen is defined, but parameters are included for alternative specimen sizes for use where appropriate. A range of test speeds is included.

The method is used to investigate the flexural behaviour of the test specimens and to determine the flexural strength, flexural modulus and other aspects of the flexural stress/strain relationship under the conditions defined. It applies to a freely supported beam, loaded at midspan (three-point loading test).

The method is suitable for use with the following range of materials:

— thermoplastic moulding, extrusion and casting materials, including filled and reinforced compounds in addition to unfilled types; rigid thermoplastics sheets;

— thermosetting moulding materials, including filled and reinforced compounds; thermosetting sheets.

In agreement with ISO 10350-1[5] and ISO 10350-2[6], this document applies to fibre-reinforced compounds with fibre lengths ≤7,5 mm prior to processing. For long-fibre-reinforced materials (laminates) with fibre lengths >7,5 mm, see ISO 14125[7].

The method is not normally suitable for use with rigid cellular materials or sandwich structures containing cellular material. In such cases, ISO 1209-1[3] and/or ISO 1209-2[4] can be used.

NOTE 1 For certain types of textile-fibre-reinforced plastic, a four-point bending test is used. This is described in ISO 14125.

The method is performed using specimens which can be either moulded to the specified dimensions, machined from the central section of a standard multipurpose test specimen (see ISO 20753) or machined from finished or semi-finished products, such as mouldings, laminates, or extruded or cast sheet.

The method specifies the preferred dimensions for the test specimen. Tests which are carried out on specimens of different dimensions, or on specimens which are prepared under different conditions, can produce results which are not comparable. Other factors, such as the test speed and the conditioning of the specimens, can also influence the results.

NOTE 2 Especially for injection moulded semi-crystalline polymers, the thickness of the oriented skin layer, which is dependent on the moulding conditions, also affects the flexural properties.

The method is not suitable for the determination of design parameters but can be used in materials testing and as a quality control test.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 293, *Plastics — Compression moulding of test specimens of thermoplastic materials*

ISO 294-1:2017, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 1: General principles, and moulding of multipurpose and bar test specimens*

ISO 295, *Plastics — Compression moulding of test specimens of thermosetting materials*

ISO 2602, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

ISO 2818, *Plastics — Preparation of test specimens by machining*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

ISO 10724-1, *Plastics — Injection moulding of test specimens of thermosetting powder moulding compounds (PMCs) — Part 1: General principles and moulding of multipurpose test specimens*

ISO 16012, *Plastics — Determination of linear dimensions of test specimens*

ISO 20753, *Plastics — Test specimens*

3 Terms, definitions and symbols

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org

3.1
test speed
v
rate of relative movement between the specimen supports and the loading edge

Note 1 to entry: It is expressed in millimetres per minute (mm/min).

3.2
flexural stress
σ_f
nominal stress at the outer surface of the test specimen at midspan

Note 1 to entry: It is calculated from the relationship given in Formula (5).

Note 2 to entry: It is expressed in megapascals (MPa).

3.3
flexural stress at break
σ_{fB}
flexural stress at break of the test specimen

Note 1 to entry: It is expressed in megapascals (MPa).

Note 2 to entry: See Figure 1, curves a and b.

3.4
flexural strength
σ_{fM}
maximum *flexural stress* (3.2) sustained by the test specimen during a bending test

Note 1 to entry: It is expressed in megapascals (MPa).

Note 2 to entry: See Figure 1, curves a and b.

